



# ANT95LZ Hardware Manual

Revision: 1.00.00



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## Safety Procedures and Warnings

Read this manual in its entirety before installing, operating, or servicing this product. If you do not understand the information contained herein, contact an Aerotech representative before proceeding. Strictly adhere to the statements given in this section and other handling, use, and operational information given throughout the manual to avoid injury to you and damage to the equipment.

The following statements apply wherever the Warning or Danger symbol appears within this manual. Failure to observe these precautions could result in serious injury to those individuals performing the procedures and/or damage to the equipment.



**DANGER:** This product contains potentially lethal voltages. To reduce the possibility of electrical shock, bodily injury, or death the following precautions must be followed.

1. Access to the ANT95LZ and component parts must be restricted while connected to a power source.
2. Do not connect or disconnect any electrical components or connecting cables while connected to a power source.
3. Disconnect electrical power before servicing equipment.
4. All components must be properly grounded in accordance with local electrical safety requirements.
5. Operator safeguarding requirements must be addressed during final integration of the product.



**WARNING:** To minimize the possibility of electrical shock, bodily injury or death the following precautions must be followed.

1. Moving parts can cause crushing or shearing injuries. Access to all stage and motor parts must be restricted while connected to a power source.
2. Cables can pose a tripping hazard. Securely mount and position all system cables to avoid potential hazards.
3. Do not expose this product to environments or conditions outside of the listed specifications. Exceeding environmental or operating specifications can cause damage to the equipment.
4. The ANT95LZ stage must be mounted securely. Improper mounting can result in injury and damage to the equipment.
5. Use care when moving the ANT95LZ stage. Lifting or transporting the ANT95LZ stage improperly can result in injury or damage to the ANT95LZ.
6. This product is intended for light industrial manufacturing or laboratory use. Use of this product for unintended applications can result in injury and damage to the equipment.
7. If the product is used in a manner not specified by the manufacturer, the protection provided by the product can be impaired and result in damage, shock, injury, or death.
8. Operators must be trained before operating this equipment.
9. All service and maintenance must be performed by qualified personnel.

## EU Declaration of Incorporation

**Manufacturer:** Aerotech, Inc.  
101 Zeta Drive  
Pittsburgh, PA 15238-2811  
USA

**herewith declares that the product:**  
ANT95LZ

**is intended to be incorporated into machinery to constitute machinery covered by the Directive 2006/42/EC as amended;**

**and that the following harmonized European standards have been applied:**

EN ISO 12100:2010

Safety of machinery - Basic concepts, general principles for design

EN 60204-1:2010

Safety of machinery - Electrical equipment of machines - Part 1: General requirements

**and further more declares that**

**it is not allowed to put the equipment into service until the machinery into which it is to be incorporated or of which it is to be a component has been found and declared to be in conformity with the provisions of the Directive 2006/42/EC and with national implementing legislation, i.e., as a whole, including the equipment referred to in this Declaration.**

*This is to certify that the aforementioned product is in accordance with the applicable requirements of the following Directive(s):*

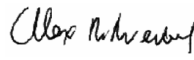
2011/65/EU

RoHS 2 Directive

**Authorized Representative:** Simon Smith, European Director

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**Name**

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**Position**

Engineer Verifying Compliance

**Location**

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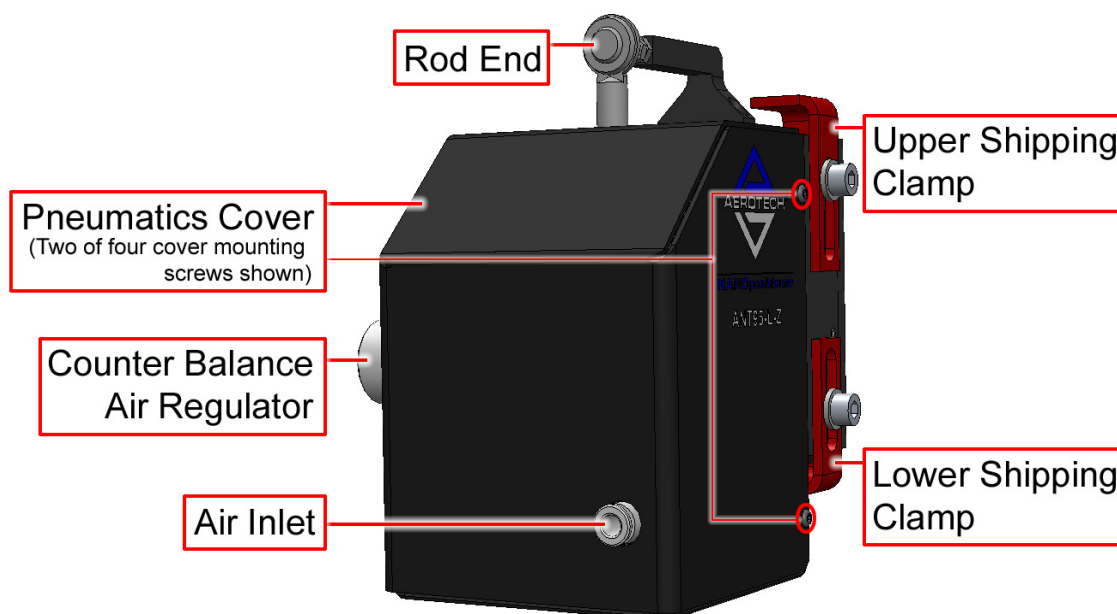


## Chapter 1: Overview

**NOTE:** Aerotech continually improves its product offerings; listed options may be superseded at any time. All drawings and illustrations are for reference only and were complete and accurate as of this manual's release. Refer to [www.aerotech.com](http://www.aerotech.com) for the most up-to-date information.

**Table 1-1: ANT95LZ Model Numbering System**

ANT95LZ Single-Axis Z Direct-Drive Nanopositioning Stage	
Travel (Required)	
-025	25 mm travel
-050	50 mm travel
Cable Orientation (Required)	
-CBL1	Right-hand cable exit
-CBL2	Lef-hand cable exit
Performance Grade (Required)	
-PL1	Base performance
-PL2	High-accuracy performance, PLUS



**Figure 1-1: ANT95LZ**

## 1.1. Environmental Specifications



**WARNING:** Do not expose this product to environments or conditions outside of the listed specifications. Exceeding environmental or operating specifications can cause damage to the equipment.

**Table 1-2: Environmental Specifications**

<b>Ambient Temperature</b>	Operating: 10° to 35° C (50° to 95° F) The optimal operating temperature is 20° C $\pm$ 2° C (68° F $\pm$ 4° F). If at any time the operating temperature deviates from 20° C degradation in performance could occur.
	Storage: 0° to 40° C (32° to 104° F) in original shipping packaging
<b>Humidity</b>	Operating: 20% to 60% RH
	Storage: 10% to 70% RH, non-condensing in original packaging. The stage should be packaged with desiccant if it is to be stored for an extended time.
<b>Altitude</b>	Operating: 0 m to 2,000 m (0 ft to 6,562 ft) above sea level Contact Aerotech if your specific application involves use above 2,000 m or below sea level.
<b>Vibration</b>	Use the system in a low vibration environment. Excessive floor or acoustical vibration can affect system performance. Contact Aerotech for information regarding your specific application.
<b>Protection Rating</b>	The ANT95LZ stages are not suited for dusty or wet environments. This equates to an ingress protection rating of IP00.
<b>Use</b>	Indoor use only

## 1.2. Accuracy and Temperature Effects

Aerotech products are designed for and built in a 20°C (68°F) environment. Extreme temperature changes could cause a decrease in performance or permanent damage to the ANT95LZ. At a minimum, the environmental temperature must be controlled to within 0.25°C per 24 hours to ensure the ANT95LZ specifications are repeatable over an extended period of time. The severity of temperature effects on all specifications depends on many different environmental conditions, including how the ANT95LZ is mounted. Contact the factory for more details.

The thermal expansion coefficient of the encoder scale is 3.25 ppm/°C. Travel will increase or decrease at this rate as the temperature of the encoder scale temperature deviates from 20°C (68°F).

The accuracy specification of ANT95LZ series stages is measured 25 mm above the table with the stage in an unloaded condition. The stage is assumed to be fully supported by a mounting surface meeting or exceeding the specification in [Section 2.3](#).

### 1.3. Basic Specifications

**NOTE:** Aerotech continually improves its product offerings; listed options may be superseded at any time. All drawings and illustrations are for reference only and were complete and accurate as of this manual's release. Refer to [www.aerotech.com](http://www.aerotech.com) for the most up-to-date information.

Resolution is dependent on encoder resolution and controller interpolation.

**Table 1-3: ANT95LZ Series Specifications (-025 and -050)**

		-025	-050
Travel		25 mm (1 in)	50 mm (2 in)
Accuracy <sup>(1)</sup>	Base	±4.0 μm (±160 μin)	±4.0 μm (±160 μin)
	PLUS <sup>(4)</sup>	±300 nm (±12 μin)	±300 nm (±12 μin)
Resolution (Minimum Incremental Motion)		2 nm	2 nm
Bidirectional Repeatability <sup>(1)</sup>	Base	±100 nm	±100 nm
	PLUS <sup>(4)</sup>	±75 nm	±75 nm
Unidirectional Repeatability		±50 nm	±50 nm
Straightness <sup>(1)</sup>		±2.25 μm (±90 μin)	±3.0 μm (±120 μin)
Flatness <sup>(1)</sup>		±3.5 μm (±140 μin)	±4.0 μm (±160 μin)
Pitch		10 arc sec	10 arc sec
Roll		10 arc sec	10 arc sec
Yaw		5 arc sec	5 arc sec
Maximum Speed		200 mm/s (8 in/s)	200 mm/s (8 in/s)
Maximum Acceleration (No Load)		1 g - 10m/s <sup>2</sup>	1 g - 10m/s <sup>2</sup>
In-Position Stability <sup>(2)</sup>		<2 nm (<0.08 μin)	<2 nm (<0.08 μin)
Maximum Force (Continuous)		7.75 N	9.5 N
Load Capacity (Vertical) <sup>(3)</sup>		5.0 kg (11 lb)	5.0 kg (11 lb)
Moving Mass		0.46 kg (1.0 lb)	0.52 kg (1.1 lb)
Stage Mass		1.9 kg (4.3 lb)	2.5 kg (5.5 lb)
Material		Aluminum Body/Black Hardcoat Finish	
Mean Time Between Failure		30,000 Hours	
1. Certified with each stage.			
2. In-Position Jitter listing is 3 sigma value.			
3. Axis orientation for on-axis loading is listed (refer to <a href="#">Section 2.4</a> for offset loading behavior).			
4. Requires the use of an Aerotech controller.			
Specifications are for single-axis systems ; performance of multi-axis system is payload and workpoint dependent. Consult the Aerotech factory for multi-axis or non-standard applications.			

## 1.4. Air Requirements

It is important to the operation of the ANT95LZ that the air supply meets Aerotech specifications. The air must be filtered to 0.25 microns, dry to 0°F dew point, and oil free (nitrogen at 99.99% purity is recommended). Filtration is required to prevent particles from clogging internal components of the ANT95LZ.

The low friction air cylinder consumes air as described in [Figure 1-2](#).

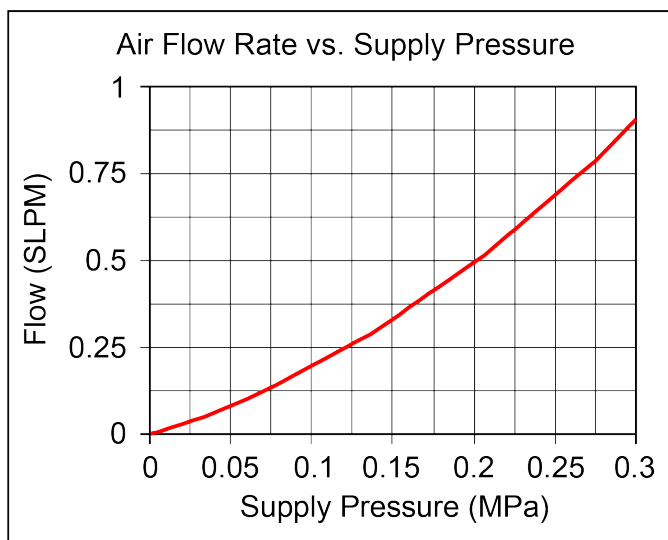


Figure 1-2: Counterbalance Air Flow vs. Counterbalance Pressure

## Chapter 2: Mechanical Specifications and Installation



**WARNING:** ANT95LZ installation must be in accordance to instructions provided by this manual and any accompanying documentation. Failure to follow these instructions could result in injury or damage to the equipment.

### 2.1. Unpacking and Handling the Stage



**WARNING:** It is the customer's responsibility to safely and carefully lift the stage.

- Make sure that all moving parts are secure before moving the ANT95LZ. Unsecured moving parts may shift and cause bodily injury.
- Improper handling could adversely affect the performance of the ANT95LZ. Use care when moving the ANT95LZ.

**NOTE:** If any damage has occurred during shipping, report it immediately.

Carefully remove the ANT95LZ from its protective shipping container. Gently set the ANT95LZ on a smooth, flat, and clean surface.

Before operating the ANT95LZ, it is important to let it stabilize at room temperature for at least 12 hours. Allowing it to stabilize to room temperature will ensure that all of the alignments, preloads, and tolerances are the same as they were when tested at Aerotech. Use compressed nitrogen or clean, dry, oil-less air to remove any dust or debris that has collected during shipping.

Each ANT95LZ has a label listing the system part number and serial number. These numbers contain information necessary for maintaining or updating system hardware and software. Locate this label and record the information for later reference.

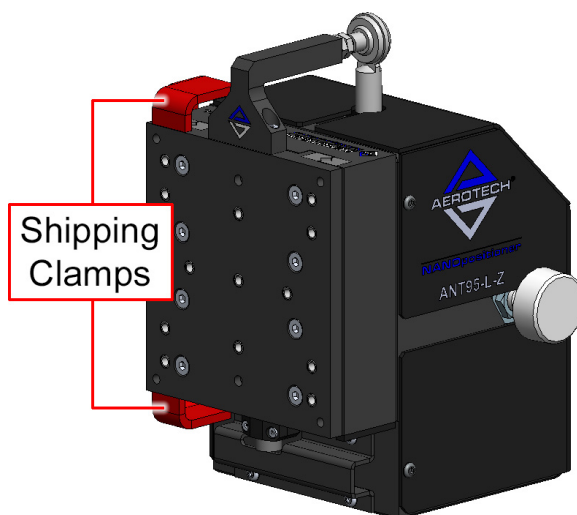


Figure 2-1: Shipping Clamps

## 2.2. Dimensions

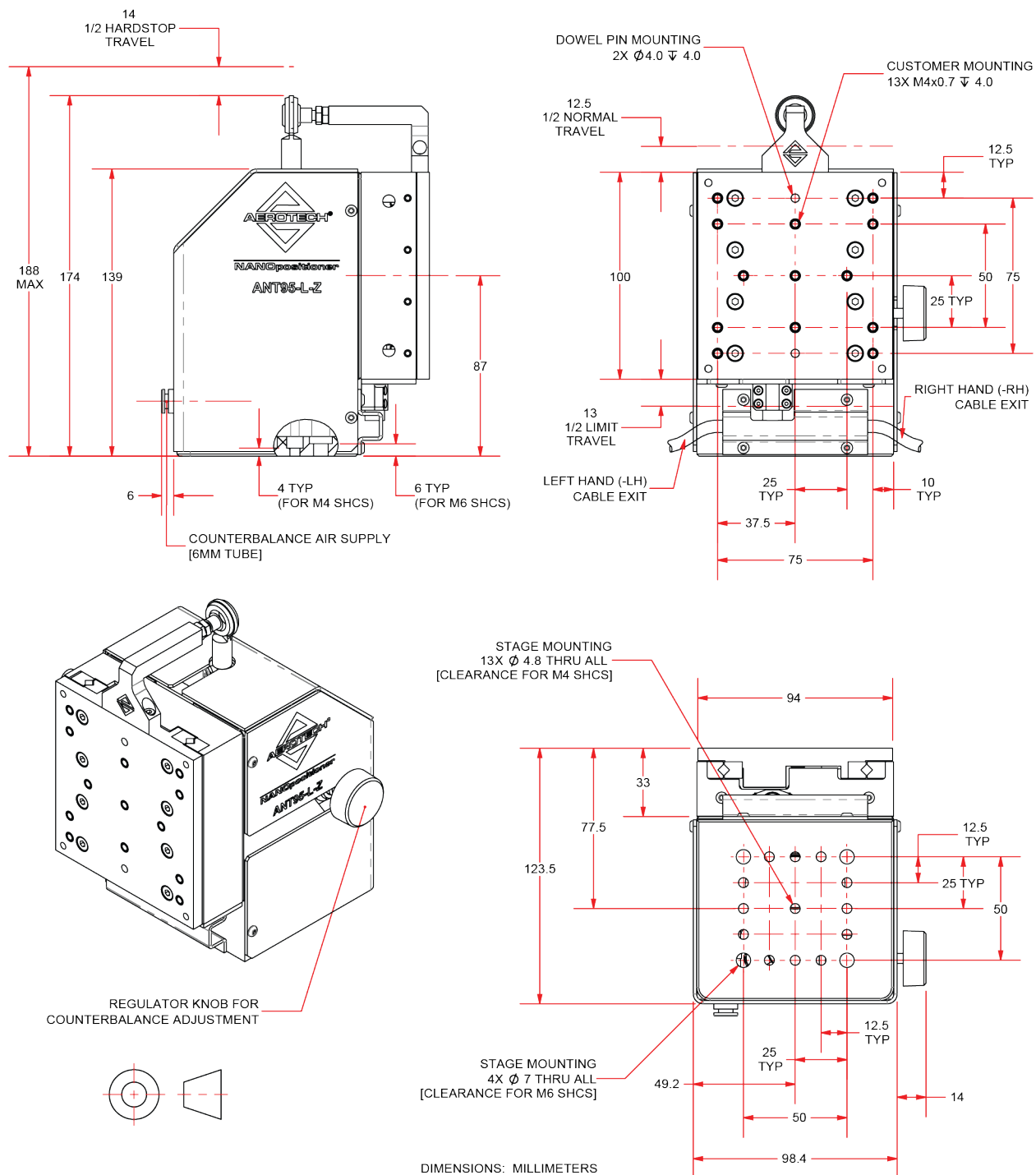


Figure 2-2: ANT95LZ-025 Dimensions

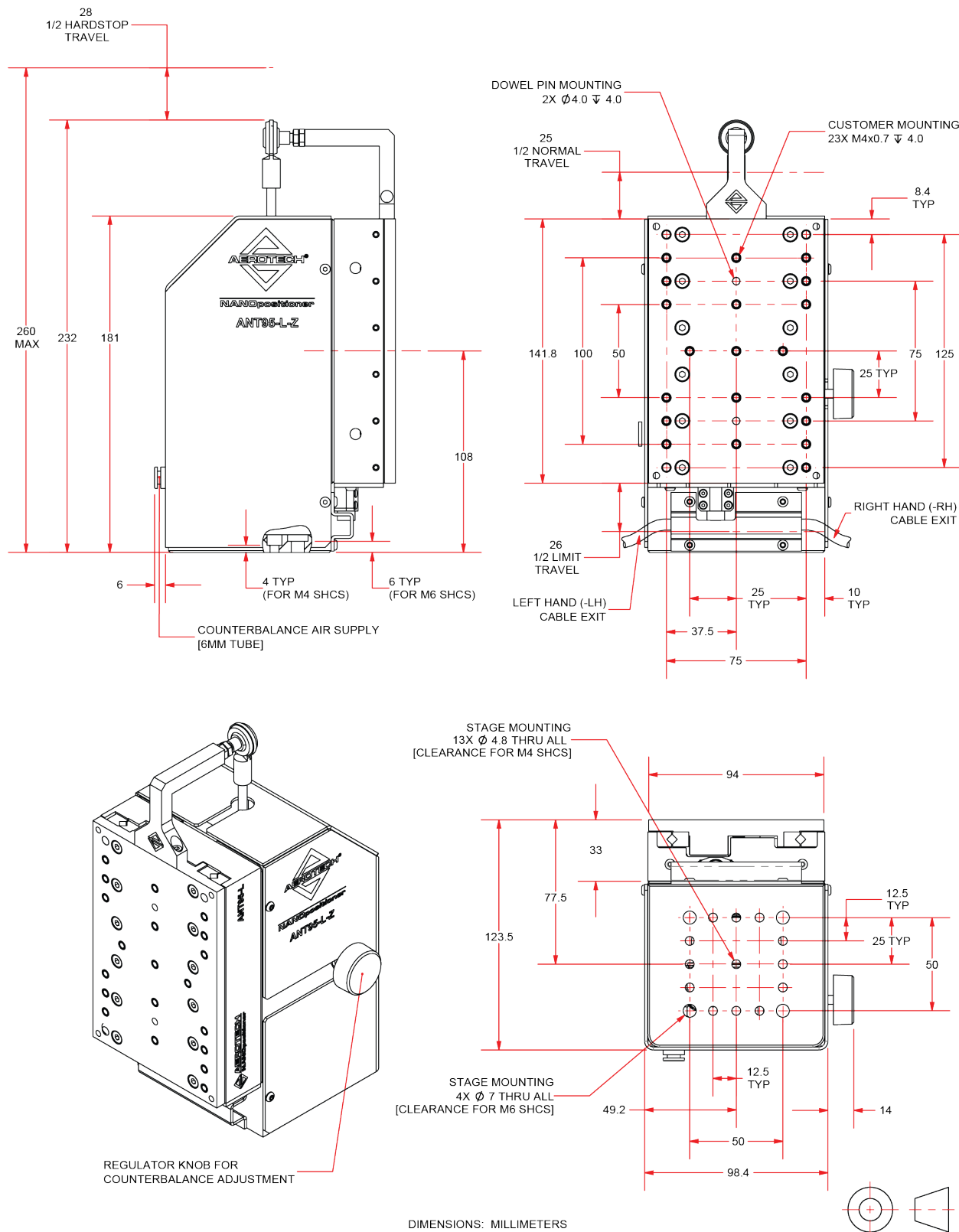


Figure 2-3: ANT95LZ-050 Dimensions

## 2.3. Securing the Stage to the Mounting Surface



**WARNING:** The ANT95LZ must be mounted securely. Improper mounting can result in injury and damage to the equipment.

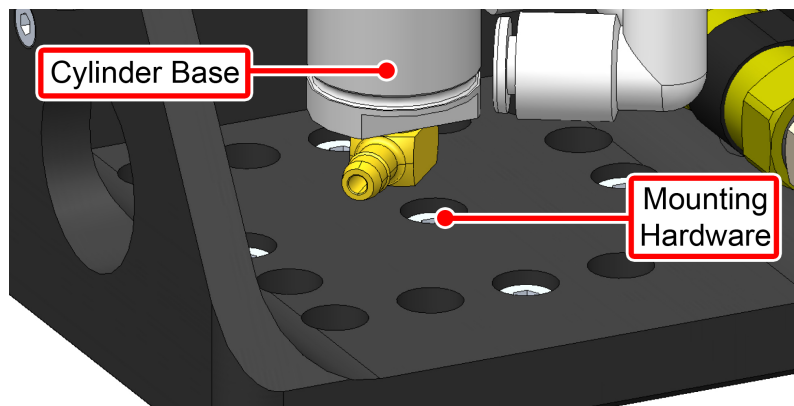
The mounting surface must be flat and have adequate stiffness in order to achieve the maximum performance from the ANT95LZ stage. When it is mounted to a non-flat surface, the stage can be distorted as the mounting screws are tightened. This distortion will decrease overall accuracy. Adjustments to the mounting surface must be done before the stage is secured.

Inspect the mounting surface for dirt or unwanted residue and clean if necessary. Use precision flatstones on the mounting surface to remove any burrs or high spots. Clean the mounting surface with a lint free cloth and acetone or isopropyl alcohol and allow the cleaning solvent to completely dry. Gently place the stage on the mounting surface.

**NOTE:** To maintain accuracy, the mounting surface must be flat to within 1  $\mu\text{m}$  per 50 mm.

**NOTE:** The ANT95LZ is precision machined and verified for flatness prior to product assembly at the factory. If machining is required to achieve the desired flatness, it should be performed on the mounting surface rather than the ANT95LZ. Shimming should be avoided if possible. If shimming is required, it should be minimized to retain maximum rigidity of the system.

1. Verify that the shipping clamps are secure.
2. Remove the pneumatics cover. It is attached to the vertical angle bracket with four M3 button head screws.
  - a. [25 mm Travel Only] Manually lift the Z-Axis tabletop while sliding off the pneumatics cover so that the cylinder rod end does not catch on the cover slot.
  - b. Manually set the Z-Axis tabletop back down on the lower shipping bracket.
3. Mount the Z-Axis assembly using one of the available customer mounting patterns shown in [Section 2.2](#). You can manually, but gently, move the base of the pneumatics cylinder to the left or right to gain access to mounting holes in the vertical angle bracket. A long ball end T-handle is recommended.
  - a. Tightening torque values are dependent on the properties of the surface on which the stage is being mounted. Typical tightening torque for an M4 x 0.7 socket head cap screw is 2.0 N·m.
4. Reattach the pneumatics cover by reversing steps used to remove it.



**Figure 2-4: Mounting Hole Pattern (and Pneumatics Cylinder Clearance)**



### 2.3.1. Setting up the Pneumatic Counterbalance



**WARNING:** Failure to adjust the counterbalance per the following instructions could result in bodily injury as well as stage and payload damage.



**WARNING:** Sudden loss of pressure to the pneumatic counterbalance will cause the carriage to drop rapidly. This could result in bodily injury as well as stage and payload damage.

By default, the ANT95LZ pneumatic counterbalances are factory set to operate in the as-shipped condition. For stages that are shipped unloaded, the counterbalance is set for the mass of the carriage only. For stages that ship with payloads or other axes attached, the counterbalance is set for the mass of the carriage plus the additional mass. Any adjustment to the mass that is carried by the counterbalance cylinders, either adding or subtracting payload, necessitates an adjustment to the counterbalance pressure supplied to the pneumatic cylinders.

Standard ANT95LZ stages have two counterbalance cylinders with a combined piston area of  $=1.98 \times 10^{-4} \text{ m}^2$ , and the moving mass of a standard ANT95LZ carriage assembly is 0.5 kg (1.1 lb). An estimate of the counterbalance pressure required to support additional load is given by the following:

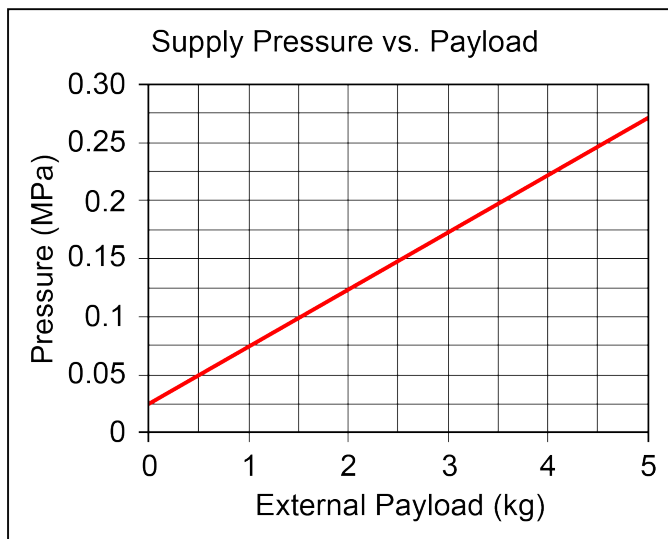
$$P_c = ((m_p + 0.5) * 9.81) / (1.98 \times 10^{-4}) / 1 \times 10^6 \text{ {MPa}}$$

where

$P_c$  = Required counterbalance pressure in MPa (maximum 0.6 MPa allowed)

$m_p$  = mass of external payload in kg.

This relationship is shown graphically in [Figure 2-5](#).



**Figure 2-5: Counterbalance Pressure vs. External Payload**

**Procedure for initial pneumatic counterbalance setup:**

**NOTE:** Refer to [Section 1.4](#) for air requirements. Be sure that the air supply meets specifications prior to continuing.

1. Verify that the stage is mounted and the shipping brackets are secure.
2. Loosen all shipping bracket mounting screws (M6 BHCS) by one or two turns, but do not remove the screws. This will allow a small amount of travel for counterbalance setup.
3. Connect the airline to the air supply, and slowly turn on the supply pressure to the counterbalance. The pressure supply should exceed the pressure determined by [Figure 2-5](#).
  - a. The tabletop should still be hanging from the loose shipping brackets. If the tabletop starts to slowly rise, gradually lower the air supply pressure using the stage's regulator knob (refer to [Figure 1-1](#)) until the carriage hangs from the shipping brackets. Counterclockwise rotation of the knob decreases the pressure to the counterbalance cylinder.
4. Slowly increase pressure to the cylinder (clockwise rotation of the regulator knob) until the carriage just starts to rise. Adjust the pressure with the regulator such that when you move the carriage to a new position by hand, the carriage neither rises nor falls.
5. The system is now balanced.
6. Remove the shipping brackets from the base. Retain the shipping brackets for future use.
7. Proceed with the electrical installation and test the motion control system in accordance with the system documentation. For information on electrical connections, refer to [Chapter 3](#).

To turn off the air supply to the stage once the shipping brackets have been removed:

1. Make sure the stage is not under servo control.
2. Gently push the carriage down to the bottom of travel until the mechanical shock engages.
3. Turn off the counterbalance pressure. Once the counterbalance pressure has completely bled out, release the hand pressure on the carriage.

To change the payload on the stage (add or remove mass), refer to [Section 2.4](#).

## 2.4. Attaching the Payload to the Stage

Inspect the mounting surface for dirt or unwanted residue and clean if necessary. Clean the mounting surface with a lint free cloth and acetone or isopropyl alcohol and allow the cleaning solvent to completely dry.

To prevent damage to the payload or stage, test the operation of the stage before the payload is attached. Aerotech recommends that customers use a representative payload during start-up to prevent accidental damage to the stage and the payload. Proceed with the electrical installation and test the motion control system in accordance with the system documentation. Document all results for future reference. For information on electrical installation refer to [Chapter 3](#) and the documentation delivered with the stage.

**NOTE:** If your ANT95LZ was purchased with Aerotech controls, it might have been tuned with a representative payload based on the information provided at the time of order. If the ANT95LZ is started up without a payload, the servo gains provided by Aerotech with the shipment may not be appropriate and servo instability can occur. Refer to the controller help file for tuning assistance.

The payload must be flat, rigid, and comparable to the stage in quality to maintain optimum performance.

**NOTE:** For valid system performance, the mounting interface should be flat within 5  $\mu\text{m}$ .



**WARNING:** Refer to the counterbalance setup instructions if the payload on the stage is changed.



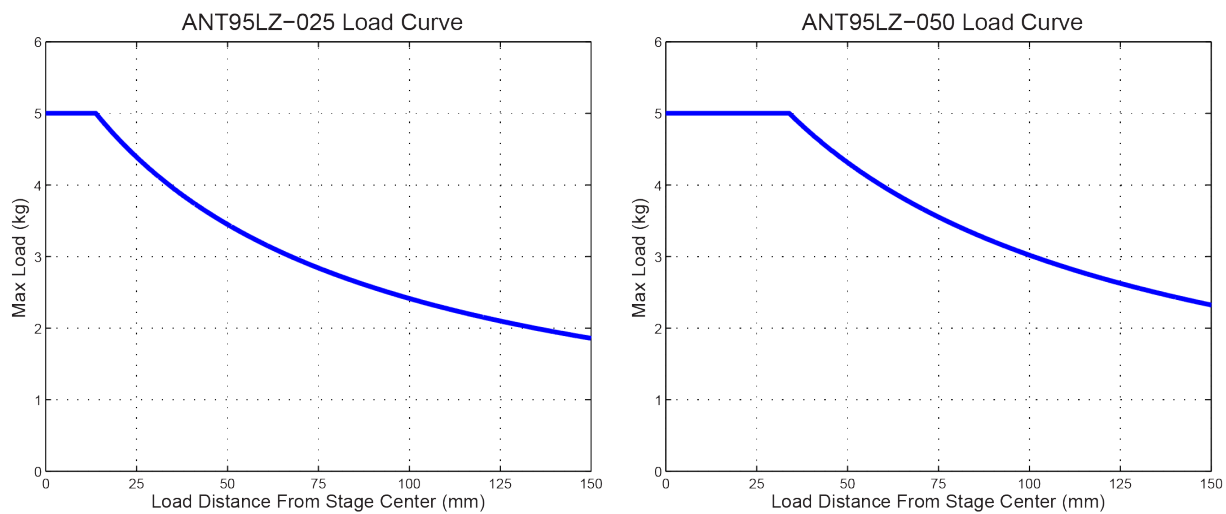
**WARNING:** Refer to the dimensions in [Section 2.2](#) for maximum allowable thread engagement. A screw extending through the stage table can affect travel and damage the stage.

### ANT95LZ Payload Mounting Steps:

1. Secure the ANT95LZ to the mounting surface (outlined in [Section 2.3](#)).
2. Confirm that all electrical power is disconnected prior to making any mechanical adjustments. Do not turn off air supply to system. Adjustments to the pneumatic pressure will be required in later steps.
3. Manually center the tabletop and reattach the lower shipping bracket. This bracket was removed in [Section 2.3.1](#).
4. Attach the payload to the stage
5. Manually lift the tabletop and then slowly allow gravity to lower the tabletop while adjusting the air supply pressure until the tabletop reaches equilibrium.
6. Remove the lower shipping bracket.
7. Reconnect electrical power.

Applied loads should be symmetrically distributed whenever possible (i.e., the payload should be centered on the stage table and the entire stage should be centered on the support structure).

If cantilevered loads are applied, refer to [Figure 2-6](#) to find the maximum allowable load.



**Figure 2-6: Cantilevered Load Capabilities**

## Chapter 3: Electrical Specifications and Installation



**WARNING:** Electrical installation must be performed by properly qualified personnel.

Aerotech motion control systems are adjusted at the factory for optimum performance. When the ANT95LZ is part of a complete Aerotech motion control system, setup usually involves connecting the ANT95LZ to the appropriate drive chassis with the cables provided. Labels on the system components usually indicate the appropriate connections.

If system level integration was purchased, an electrical drawing showing system interconnects has been supplied with the system (separate from this documentation).

The electrical wiring from the motor and encoder are integrated at the factory. Refer to the following sections for standard motor wiring and connector pin assignments.



**DANGER:** Remove power before connecting or disconnecting electrical components or cables. Failure to do so may cause electric shock.



**WARNING:** Operator access to the base and tabletop must be restricted while connected to a power source. Failure to do so may cause electric shock.

**NOTE:** Refer to the controller documentation to adjust servo gains for optimum velocity and position stability.

### 3.1. Motor and Feedback Connectors

Stages equipped with standard motors and encoders come from the factory completely wired and assembled.

**NOTE:** Refer to the other documentation accompanying your Aerotech equipment. Call your Aerotech representative if there are any questions on system configuration.

The protective ground connection of the ANT95LZ provides motor frame ground protection only. Additional grounding and safety safeguards are required for applications requiring access to the stage while it is energized. The System Integrator or qualified installer is responsible for determining and meeting all safety and compliance requirements necessary for the integration of this stage into the final application.



**DANGER:** Remove power before connecting or disconnecting electrical components or cables. Failure to do so may cause electric shock.



**WARNING:** The protective ground connection must be properly installed to minimize the possibility of electric shock.

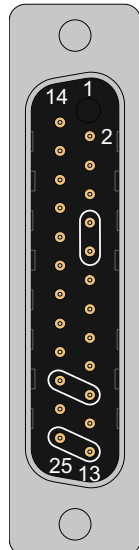


**WARNING:** Operator access to the base and tabletop must be restricted while connected to a power source. Failure to do so may cause electric shock.



**CAUTION:** The stage controller must provide over-current and over-speed protection. Failure to do so may result in permanent damage to the motor and stage components.

**Table 3-1: Feedback and Motor Pin Outs**

Pin	Description	Connector
1	Key (Ensures that correct cable is plugged into the correct jack)	
2	Cosine-N	
3	Sine-N	
4	Marker-N	
5	Common ground	
6	Common ground	
7	Negative (CCW) hardware limit	
8	Hall Effect sensor, phase A	
9	Hall Effect sensor, phase C	
10	Frame ground	
11	Motor ØA	
12	Motor ØB	
13	Motor ØC	
14	Cosine	
15	Sine	
16	Marker	
17	+5 V supply input for feedback devices	
18	Reserved	
19	Positive (CW) hardware limit	
20	Reserved	
21	Hall Effect sensor, phase B	
22	Signal shield connection	
23	Motor ØA	
24	Motor ØB	
25	Motor ØC	
Case	Signal shield connection (to case)	

1. Pins [5 and 6], [11 and 23], and [13 and 25] are not externally jumpered on the ANT95XY-025 and ANT95XY-050

Mating Connector	Aerotech P/N	Third Party P/N
Backshell	ECK00656	Amphenol #17E-1726-2
Connector	ECK00300	FCI DB25S064TLF

### 3.2. Motor and Feedback Wiring

All motor and controller manufacturers have their own designations for motor  $\emptyset A/\emptyset B/\emptyset C$  and Hall signals A/B/C (refer to for motor phasing). Shielded cables are required for the motor and feedback connections.

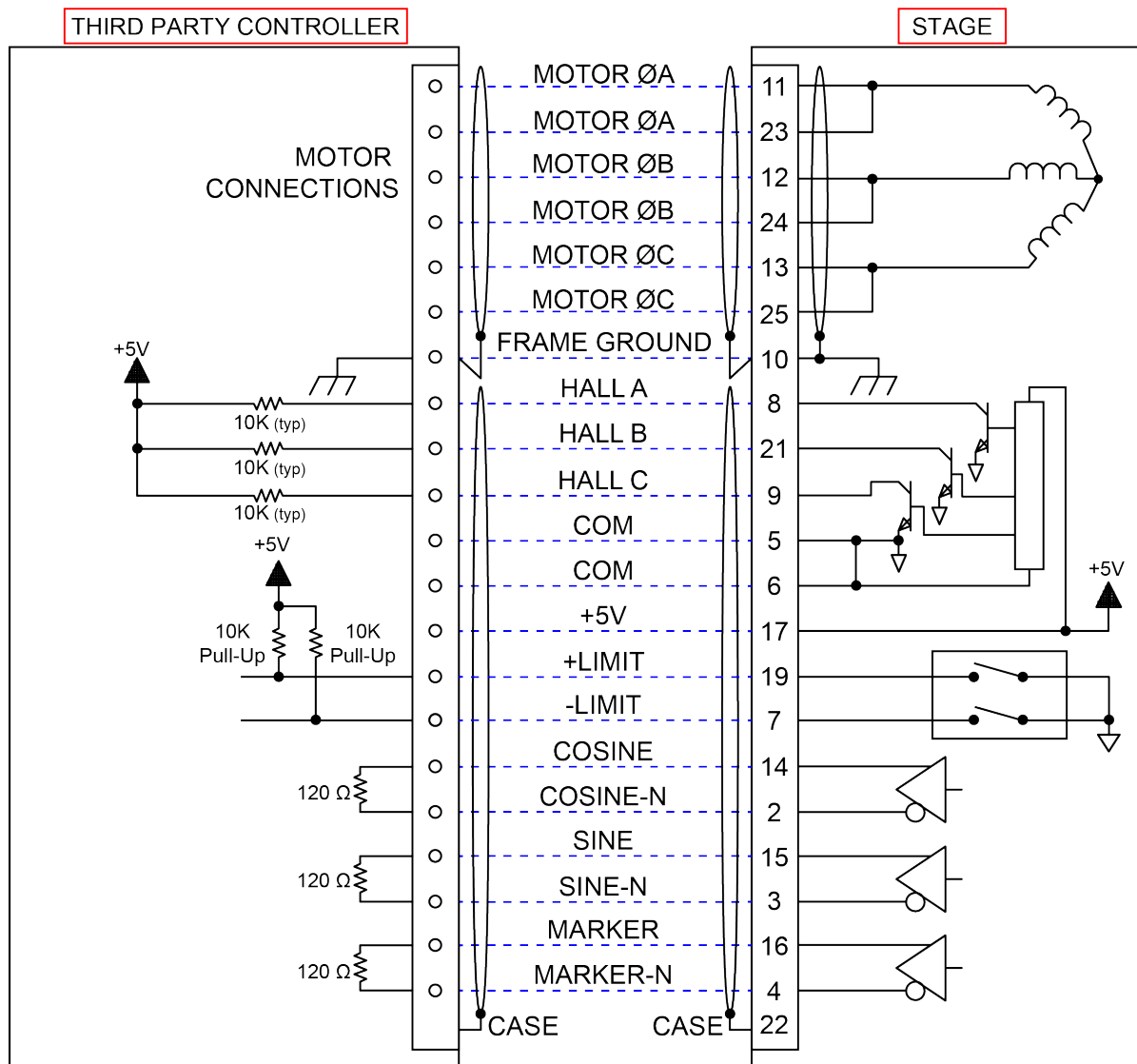


Figure 3-1: Motor and Feedback Wiring



### 3.3. Motor and Feedback Specifications

**Table 3-2: Feedback Specifications**

Hall-Effect Sensors Specifications	
Supply Voltage	5 V
Supply Current	50 mA
Output Type	Open Collector
Output Voltage	24 V max (pull up)
Output Current	5 mA (sinking)

Encoder Specifications	
Supply Voltage	5 V $\pm 10\%$
Supply Current	250 mA
Output Signals	<b>Sinusoidal Type (Incremental Encoder):</b> 1 V <sub>pk-pk</sub> into 120 $\Omega$ Load (differential signals SIN+, SIN-, COS+, COS- are .5 V <sub>pk-pk</sub> relative to ground.)

Limit Switch Specifications	
Supply Voltage	5 V
Supply Current	25 mA
Output Type	Open Collector
Output Voltage	5 V
Output Current	10 mA (sinking)
Output Polarity	Normally Closed (NC) <ul style="list-style-type: none"> <li>Sinks current to ground (Logic "0") when not in limit</li> <li>High impedance (Logic "1") when in limit</li> <li>Requires external pull-up to +5 V (10 k<math>\Omega</math> recommended)</li> </ul>
<b>Notes:</b> <ul style="list-style-type: none"> <li>If the ANT95LZ is driven beyond the electrical limit, it will encounter a mechanical stop. Impacting the mechanical stop could cause damage to the stage even at low speeds.</li> </ul>	

**Table 3-3: Motor Specifications**

		Linear Motor [ANT95LZ-025]	Linear Motor [ANT95LZ-050]
<b>Performance Specifications<sup>(1,5)</sup></b>			
Continuous Force <sup>(2)</sup>	N (lb)	7.7 (1.73)	9.7 (2.17)
<b>Electrical Specifications<sup>(5)</sup></b>			
Winding Designation		-A	-A
BEMF Constant (Line to Line, Max)	V/m/s (V/in/s)	2.86 (0.07)	3.78 (0.10)
Continuous Current <sup>(2)</sup>	Amp <sub>pk</sub> (Amp <sub>rms</sub> )	3.10 (2.19)	2.94 (2.08)
Peak Current, Stall <sup>(3)</sup>	Amp <sub>pk</sub> (Amp <sub>rms</sub> )	12.40 (8.77)	11.76 (8.31)
Force Constant, Sine Drive <sup>(4, 8)</sup>	N/Amp <sub>pk</sub> (lb/Amp <sub>pk</sub> )	2.48 (0.56)	3.28 (0.74)
	N/Amp <sub>rms</sub> (lb/Amp <sub>rms</sub> )	3.51 (0.79)	4.65 (1.05)
Motor Constant <sup>(2,4)</sup>	N/√W (lb/√W)	1.21 (0.27)	1.41 (0.32)
Resistance, 25°C (Line to Line)	ohms	4.0	5.2
Inductance (Line to Line)	mH	0.51	0.70
Thermal Resistance	°C/W	2.48	2.12
Maximum Bus Voltage	VDC	80	80
Magnetic Pole Pitch	mm (in)	16.00 (0.63)	16.00 (0.63)
1. Performance is dependent upon heat sink configuration, system cooling conditions, and ambient temperature 2. Values shown @ 100°C rise above a 25°C ambient temperature, with motor mounted to the specified aluminum heat sink. 3. Peak force assumes correct rms current; consult Aerotech. 4. Force constant and motor constant specified at stall 5. All performance and electrical specifications ±10% 6. Maximum winding temperature is 125°C. 7. Ambient operating temperature range 0 °C - 25 °C; consult Aerotech for performance in elevated ambient temperatures 8. All Aerotech amplifiers are rated Apk; use force constant in N·m/Apk when sizing.			

**Table 3-4: Encoder Specifications**

Model	ANT95LZ-025	ANT95LZ-050
Fundamental Resolution	20 μm	
with x4000 Interpolation	5 nm	
with x16000 Interpolation	1.25 nm	
1. Quadrature decoding included in interpolation resolution calculations		

### 3.4. Limits, Marker, and Machine Direction

Aerotech stages are configured to have positive and negative "machine" directions. The machine direction defines the phasing of the feedback and motor signals and is dictated by the stage wiring (refer to [Section 3.5](#) for Motor and Feedback phasing information). Programming direction of a stage is set by the controller that is used to move the stage. Programming direction is typically selectable in the controller, while machine direction is hardwired in the stage. [Figure 3-2](#) shows the machine direction of ANT95LZ stages.

CW ROTATION  
(POSITIVE  
MACHINE DIRECTION)

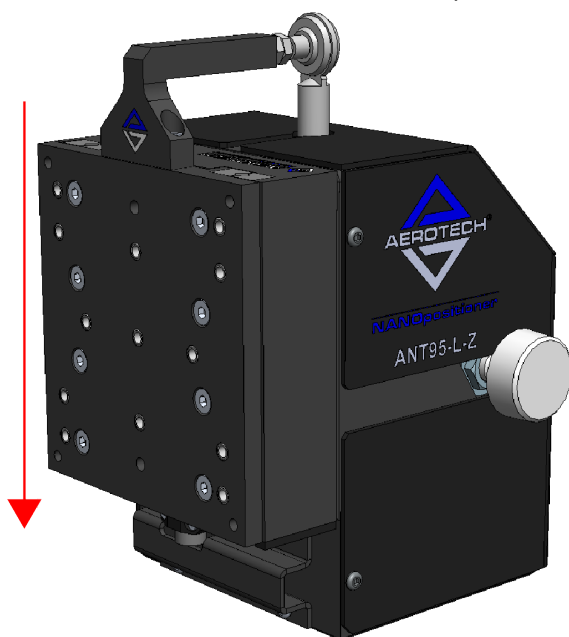
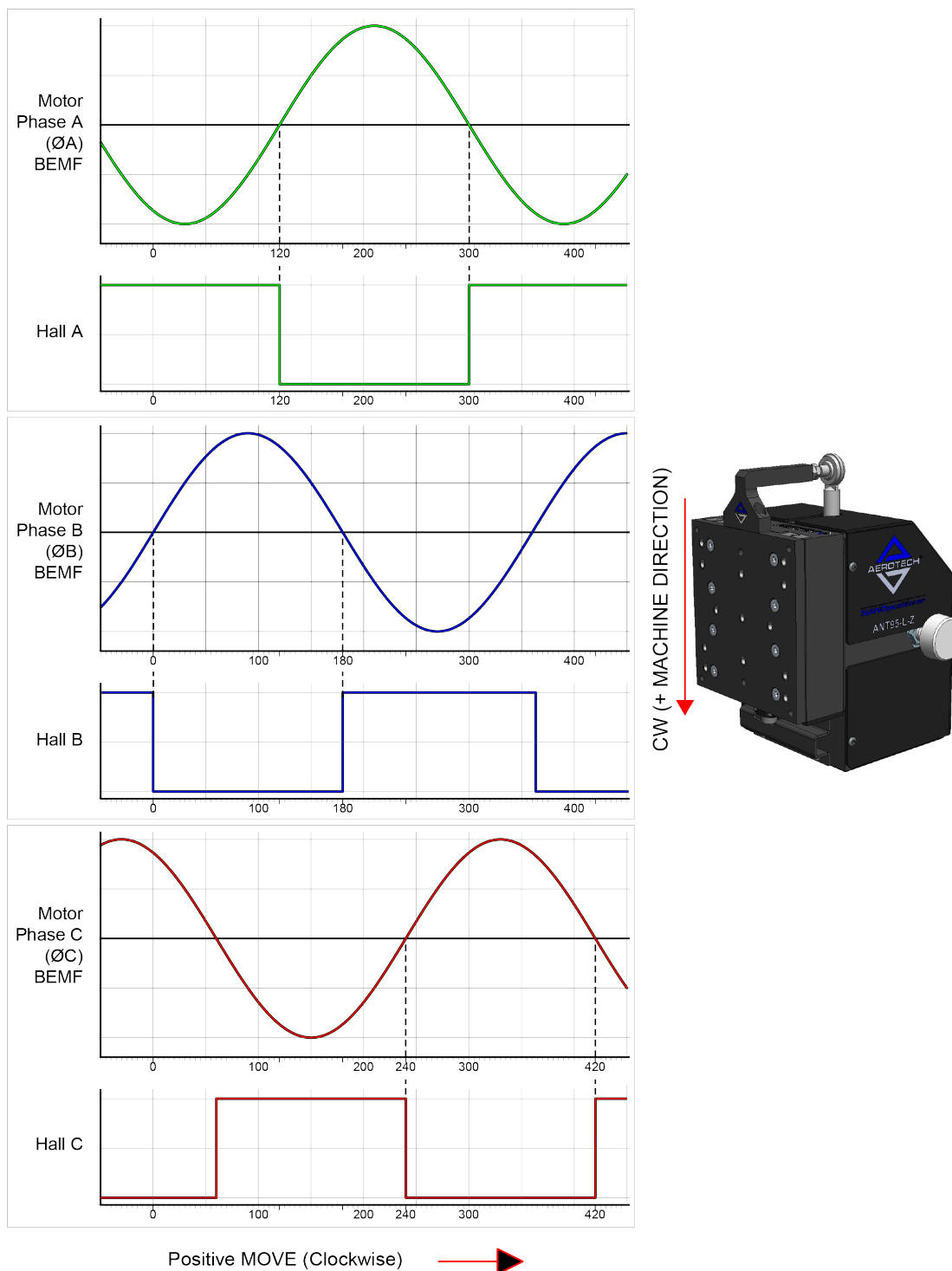


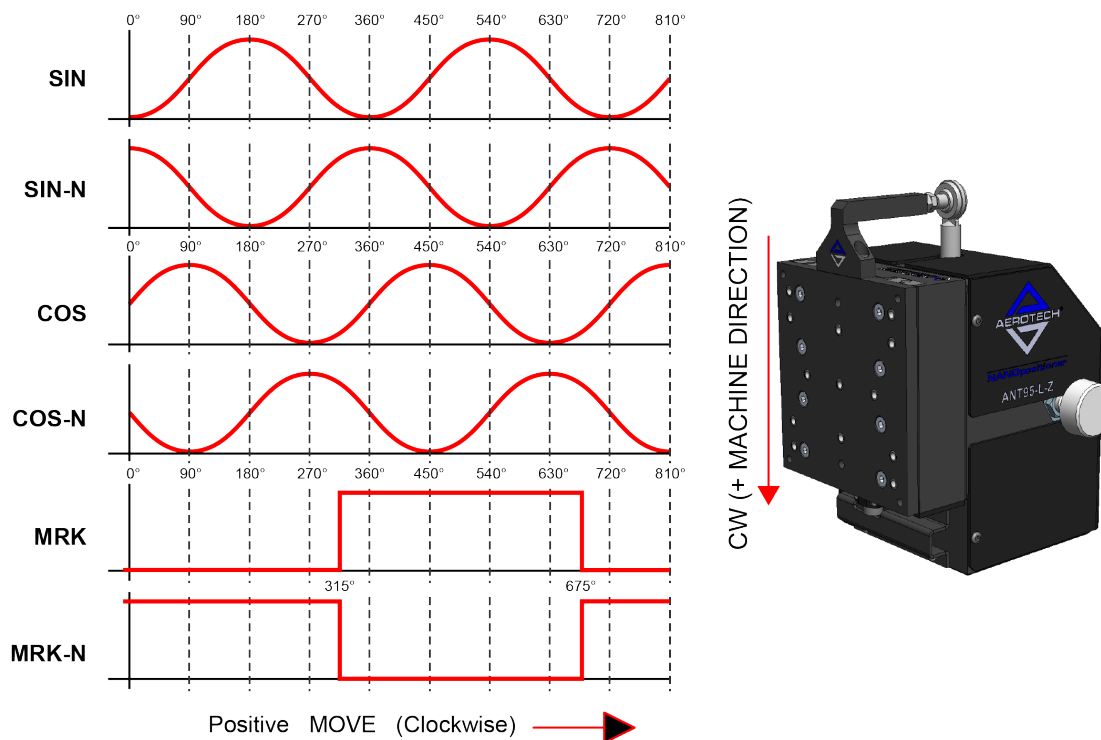
Figure 3-2: Machine Direction

### 3.5. Motor and Feedback Phasing

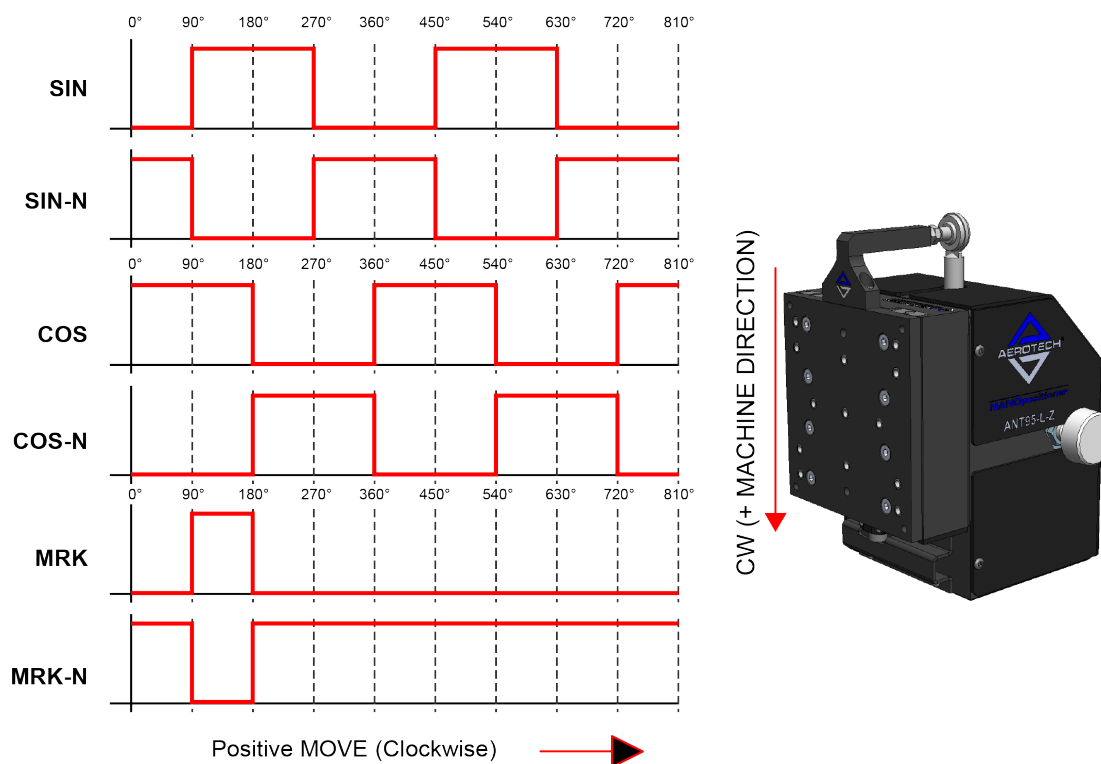
Motor phase voltage is measured relative to the virtual wye common point.



**Figure 3-3: Hall Phasing**



**Figure 3-4: Analog Encoder Phasing Reference Diagram**



**Figure 3-5: Encoder Phasing Reference Diagram (Standard)**

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## Chapter 4: Maintenance

**NOTE:** The bearing area must be kept free of foreign matter and moisture; otherwise, the performance and life expectancy of the stage will be reduced.



**DANGER:** To minimize the possibility of bodily injury or death, disconnect all electrical power prior to performing any maintenance or making adjustments to the equipment.

### 4.1. Service and Inspection Schedule

Inspect the ANT95LZ once per month. A longer or shorter inspection interval may be required depending on the specific application, and conditions such as the duty cycle, speed, and environment.

Monthly inspections should include but not be limited to:

- Visually inspect the stage and cables
- Re-tighten loose connectors
- Replace or repair damaged cables
- Clean the ANT95LZ and any components and cables as needed
- Repair any damage before operating the ANT95LZ
- Inspect and perform an operational check on all safeguards and protective devices

## 4.2. Cleaning and Lubrication



**DANGER:** To minimize the possibility of bodily injury or death, disconnect all electrical power prior to performing any maintenance or making adjustments to the equipment.



**WARNING:** In applications that have multiple stages bolted together to form multi-axis systems, the orthogonality may be lost if the stage tables of the support stages are loosened. Precision aligned stages should not be loosened or disassembled.



**WARNING:** Further disassembly of the stage is not recommended because proper assembly and calibration can only be done at the factory. In addition, a laser interferometer is required for post assembly verification to maintain warranties. Contact Aerotech for more information.

### Cleaning

Before using a cleaning solvent on any part of the ANT95LZ, blow away small particles and dust with nitrogen or, less preferably, clean, dry, compressed air.

Any external metal surface of the ANT95LZ can be cleaned with isopropyl alcohol on a lint-free cloth.



**WARNING:** Make sure that all solvent has completely evaporated before attempting to move the stage.

### Lubrication

If the application process uses only a small portion of travel for most of the duty cycle, periodically drive the stage through full travel to redistribute the lubrication in the bearings.



### 4.3. Troubleshooting

Symptom	Possible Cause and Solution
Stage will not move	<ul style="list-style-type: none"><li>• Shipping restraints still installed. Remove the red anodized shipping brackets.</li><li>• In Limit condition. Check limits (refer to <a href="#">Chapter 3</a>) and refer to controller documentation for polarity and compatibility requirements (Example: voltage requirements).</li><li>• Controller trap or fault (refer to controller documentation).</li><li>• Emergency stop fault. The system is configured to operate with an air pressure safety switch, and either the air pressure is too low or the switch is not present. Check the air supply and the switch. Air pressure switches are typically configured to trip if the supply pressure to the bearing drops below 40 psi.</li></ul>
Stage moves uncontrollably	<ul style="list-style-type: none"><li>• Encoder (sine and cosine) signal connections (refer to <a href="#">Chapter 3</a> and Controller documentation).</li><li>• Motor Connections (refer to <a href="#">Chapter 3</a> and Controller documentation).</li></ul>
Stage oscillates or squeals	<ul style="list-style-type: none"><li>• Gains misadjusted (refer to the controller documentation).</li><li>• Encoder signals (refer to the controller documentation).</li></ul>

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## Appendix A: Warranty and Field Service

Aerotech, Inc. warrants its products to be free from harmful defects caused by faulty materials or poor workmanship for a minimum period of one year from date of shipment from Aerotech. Aerotech's liability is limited to replacing, repairing or issuing credit, at its option, for any products that are returned by the original purchaser during the warranty period. Aerotech makes no warranty that its products are fit for the use or purpose to which they may be put by the buyer, whether or not such use or purpose has been disclosed to Aerotech in specifications or drawings previously or subsequently provided, or whether or not Aerotech's products are specifically designed and/or manufactured for buyer's use or purpose. Aerotech's liability on any claim for loss or damage arising out of the sale, resale, or use of any of its products shall in no event exceed the selling price of the unit.

THE EXPRESS WARRANTY SET FORTH HEREIN IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, BY OPERATION OF LAW OR OTHERWISE. IN NO EVENT SHALL AEROTECH BE LIABLE FOR CONSEQUENTIAL OR SPECIAL DAMAGES.

### Return Products Procedure

Claims for shipment damage (evident or concealed) must be filed with the carrier by the buyer. Aerotech must be notified within thirty (30) days of shipment of incorrect material. No product may be returned, whether in warranty or out of warranty, without first obtaining approval from Aerotech. No credit will be given nor repairs made for products returned without such approval. A "Return Materials Authorization (RMA)" number must accompany any returned product(s). The RMA number may be obtained by calling an Aerotech service center or by submitting the appropriate request available on our website ([www.aerotech.com](http://www.aerotech.com)). Products must be returned, prepaid, to an Aerotech service center (no C.O.D. or Collect Freight accepted). The status of any product returned later than thirty (30) days after the issuance of a return authorization number will be subject to review.

Visit <https://www.aerotech.com/global-technical-support.aspx> for the location of your nearest Aerotech Service center.

### Returned Product Warranty Determination

After Aerotech's examination, warranty or out-of-warranty status will be determined. If upon Aerotech's examination a warranted defect exists, then the product(s) will be repaired at no charge and shipped, prepaid, back to the buyer. If the buyer desires an expedited method of return, the product(s) will be shipped collect. Warranty repairs do not extend the original warranty period.

**Fixed Fee Repairs** - Products having fixed-fee pricing will require a valid purchase order or credit card particulars before any service work can begin.

**All Other Repairs** - After Aerotech's evaluation, the buyer shall be notified of the repair cost. At such time the buyer must issue a valid purchase order to cover the cost of the repair and freight, or authorize the product(s) to be shipped back as is, at the buyer's expense. Failure to obtain a purchase order number or approval within thirty (30) days of notification will result in the product(s) being returned as is, at the buyer's expense.

Repair work is warranted for ninety (90) days from date of shipment. Replacement components are warranted for one year from date of shipment.

### Rush Service

At times, the buyer may desire to expedite a repair. Regardless of warranty or out-of-warranty status, the buyer must issue a valid purchase order to cover the added rush service cost. Rush service is subject to Aerotech's approval.

### On-site Warranty Repair

If an Aerotech product cannot be made functional by telephone assistance or by sending and having the customer install replacement parts, and cannot be returned to the Aerotech service center for repair, and if Aerotech determines the problem could be warranty-related, then the following policy applies:

Aerotech will provide an on-site Field Service Representative in a reasonable amount of time, provided that the customer issues a valid purchase order to Aerotech covering all transportation and subsistence costs. For warranty field repairs, the customer will not be charged for the cost of labor and material. If service is rendered at times other than normal work periods, then special rates apply.

If during the on-site repair it is determined the problem is not warranty related, then the terms and conditions stated in the following "On-Site Non-Warranty Repair" section apply.

### On-site Non-Warranty Repair

If any Aerotech product cannot be made functional by telephone assistance or purchased replacement parts, and cannot be returned to the Aerotech service center for repair, then the following field service policy applies:

Aerotech will provide an on-site Field Service Representative in a reasonable amount of time, provided that the customer issues a valid purchase order to Aerotech covering all transportation and subsistence costs and the prevailing labor cost, including travel time, necessary to complete the repair.

### Service Locations

<http://www.aerotech.com/contact-sales.aspx?mapState=showMap>

USA, CANADA, MEXICO	CHINA	GERMANY
Aerotech, Inc. Global Headquarters Phone: +1-412-967-6440 Fax: +1-412-967-6870	Aerotech China Full-Service Subsidiary Phone: +86 (21) 3319 7715	Aerotech Germany Full-Service Subsidiary Phone: +49 (0)911 967 9370 Fax: +49 (0)911 967 93720
JAPAN	TAIWAN	UNITED KINGDOM
Aerotech Japan Full-Service Subsidiary Phone: +81 (0)50 5830 6814 Fax: +81 (0)43 306 3773	Aerotech Taiwan Full-Service Subsidiary Phone: +886 (0)2 8751 6690	Aerotech United Kingdom Full-Service Subsidiary Phone: +44 (0)1256 855055 Fax: +44 (0)1256 855649

Have your customer order number ready before calling.

## Appendix B: Revision History

Revision	General Information
1.00.00	New manual

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